

UTILITY APPLICATION

of

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## GOLF CLUB SHAFT AND METHOD OF MANUFACTURE

### BACKGROUND OF THE INVENTION

**[0001]** The present invention relates generally to golf clubs and, more particularly, to a golf club shaft carrying an improved decal.

**[0002]** The shaft for a wood-type golf club head is typically formed of a graphite or composite material. The golf club shafts for iron-type club heads may be formed of steel, however many golfers prefer the advantages of the lighter weight composite shafts for these clubs as well. The use of composite materials for golf club shafts allows for design of specific kickpoints and flex and torsion characteristics of a shaft, for example, in combination with an overall lighter weight. The ever-increasing size of wood-type club heads and some larger iron club heads call for decreased shaft weight in order to maintain the club swing weight.

**[0003]** The identification of the shaft by manufacturer and/or performance characteristics, such as flex, may be provided by a heat transfer label or silk screening, for example. The typical heat transfer label has a length extending along the longitudinal axis of the shaft and a width that is substantially less than a circumference of the shaft. Alignment of the label about the shaft is made more difficult at least in part due to the taper of the shaft from its butt end to its tip end. However, having a relatively narrow width reduces the need to precisely align the label on the shaft. Thus, the pattern on the label typically extends less than about 270 degrees around the shaft. For example, with reference to FIG. 2, a heat transfer label 26 of the prior art is shown. The label comprises a piece of film having a first end 28 having a first width ( $W_1$ ) and a second end 30 having a second width ( $W_2$ ). Both widths are generally substantially less than the shaft's outer circumference ( $C_1, C_2$ ), as measured at respective locations where the label is applied.

**[0004]** In order to provide more than one color along the length of the shaft, time may be required to permit each color to dry before application of the next color. In particular, if a different color is desired underneath or as background to the label pattern, coloring and drying times must be provided in the manufacturing schedule. Additional

layers of paint may add weight to the shaft as well. Generally, if multiple colors are desired on a shaft, additional time and cost must be considered.

**[0005]** It should, therefore, be appreciated that there exists a need for a golf club shaft having a decal that provides a multi-colored design wrapped about the shaft and that is relatively simple to align and install. The present invention fulfills this need and others.

#### SUMMARY OF THE INVENTION

**[0006]** A golf club shaft in accordance with the present invention incorporates a heat transfer decal having dimensions sized to substantially conform to the taper of the shaft at the location of the applied pattern. An imprinted design or color(s) on the decal is wrapped about the shaft at least 360 degrees. A seam formed at the junction of the longitudinal edges of the decal is barely visible and provides enhanced aesthetics to the shaft. A dark alignment band can be provided at a tip end of the decal. In addition, the decal and its application provide reduced labor and material costs per shaft thus prepared since a second (or third) color may be applied concurrently with other designs including up to 360 degree coverage around the shaft by all of them being incorporated into the decal.

**[0007]** A preferred method of the present invention for preparing a golf club shaft comprises providing a tubular member formed of a composite material and a decal. The tubular member has a butt end and a tip end and is treated on an outer surface to achieve a desired color. The decal has a length less than a length of the tubular member. The decal is wrapped about the tubular member nearer the butt end than the tip end such that its first end is closer to the butt end and its second end is closer to the tip end. The decal is heated under a prescribed pressure such that its decal adheres to the tubular member and laterally covers it in a continuous fashion.

**[0008]** The pattern on the decal has a first end having a first width that is between about 0% and 20% greater than an outer circumference of the tubular member at its butt end. A second end has a second width that is between about 0% and 20% greater than an outer circumference of the tubular member at its tip end. Preferably, the decal's first width is between about 1% and 10% and its second width is between about 1% and 10% greater

than the respective circumferences of the tubular member. The decal is preferably imprinted with at least two colors of ink.

**[0009]** A golf club having features of the present invention is formed by providing a grip at the butt end of the shaft and a club head at the tip end of the shaft. The club head may comprise a wood-type head having a volume of at least 190 cc. Alternatively, the club head may comprise an iron-type head having a loft of at least 18 degrees. Hollow, iron-type or utility club heads may also be provided at the tip end of the shaft. Although putter-type heads typically do not require or utilize composite golf club shafts, such a shaft incorporating the present invention may also be used with golf club putters.

**[0010]** For purposes of summarizing the invention and the advantages achieved over the prior art, certain advantages of the invention have been described herein above. Of course, it is to be understood that not necessarily all such advantages may be achieved in accordance with any particular embodiment of the invention. Thus, for example, those skilled in the art will recognize that the invention may be embodied or carried out in a manner that achieves or optimizes one advantage or group of advantages as taught herein without necessarily achieving other advantages as may be taught or suggested herein.

**[0011]** All of these embodiments are intended to be within the scope of the invention herein disclosed. These and other embodiments of the present invention will become readily apparent to those skilled in the art from the following detailed description of the preferred embodiments having reference to the attached figures, the invention not being limited to any particular preferred embodiment disclosed.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0012]** Embodiments of the present invention will now be described, by way of example only, with reference to the following drawings in which:

**[0013]** FIG. 1 is an elevational view of a golf club having features of the present invention.

[0014] FIG. 2 is a front view of a prior art decal affixed to a portion of a golf club shaft.

[0015] FIG. 3 is a front view of two sheets of decals for a golf club shaft in accordance with the present invention.

[0016] FIG. 4 is a front view of an alternative decal for a golf club shaft in accordance with the present invention.

[0017] FIG. 5 is a flow diagram showing the steps for preparing a golf club shaft incorporating a decal in accordance with the present invention.

[0018] FIG. 6 is a front view of yet another alternative decal for a golf club shaft in accordance with the present invention.

[0019] FIG. 7 is a front view of yet another alternative decal for a golf club shaft in accordance with the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] With reference to the illustrative drawings, and particularly to FIG. 1, a golf club 10 is shown having a heat transferred decal 12 that wraps 360 degrees around an upper portion 14 of a shaft 16 near a grip 18. The shaft has a tip end 20 to which a golf club head 22 is attached and a butt end 24 to which the grip 18 is attached. Although a wood-type golf club head is shown, it is understood that golf clubs having iron-type club heads are included in the present invention.

[0021] The shaft 16 comprises a composite material and may be manufactured according to any method known to those skilled in the art such as that disclosed in U.S. Patent No. 5,814,268, which is herein incorporated by reference. Preferably, the shaft is manufactured by wrapping plies of fiber-reinforced resin about a mandrel. Heat and pressure are applied to form the desired shape and flex and torsion characteristics for the shaft. The shaft tapers from its butt end 24 to its tip end 20, and the tip end may include a substantially constant outer diameter for a predetermined length.

[0022] With reference to FIG. 3, a plurality of heat transfer decals 36 are disposed on a carrier, i.e., sheets 34. In the exemplary embodiment, the sheet material is formed of polymer film such as Mylar® available from E. I. Du Pont de Nemours and Co., Inc. The decals are each separated from the sheet and attached to the shaft 16 via heat and pressure. Prior to the decal's application, the shaft 16 preferably has at least one layer of decorative material applied over a substantial length. For example, a primary color 17 may be provided on the shaft by spray-painting or painted on by use of a squeegee. Other decorative methods may be used as known to those skilled in the art. Typically, the butt end 24 is left undecorated along a specific length to promote the adhesive attachment of the grip 18 in a later assembly step.

[0023] The decals 36 each comprise at least two and preferably at least three colors. For example, four colors are employed on the decals shown in FIG. 3. The club name 38 ("R360XD") is red, the shaft flex 40 ("S") is yellow, a border design 42 is silver and a background or overall color 44 is charcoal gray. The decals are formed of ink in the desired colors, or combinations of inks to achieve the desired colors, applied to the sheets 34. A single layer of ink should provide sufficient color and, if desired, translucency, yet not be so thick as to result in an obvious seam at the overlap of long edges 46 of the pattern 12. Alternatively, the ink may be applied as two or more layers, yet thin, so that the overlap is not readily apparent.

[0024] An individual decal 36 has a first end (A) for placement closer to the butt end 24 of the shaft 16 and a second end (B) for placement closer to the tip end 20 of the shaft. Referring to FIG. 4, the decal is sized with a width  $W_a$  at the first end between about 0% to 20% greater than the shaft's circumference ( $C_1$ ) at the corresponding location. Preferably, the width  $W_a$  is between about 1% to 10% greater than the first circumference  $C_1$ . The decal is further sized with a width  $W_b$  at the second end between about 0% to 20% greater than the shaft's circumference ( $C_2$ ) at the corresponding location. Preferably, the width  $W_b$  is between about 1% to 10% greater than the second circumference  $C_2$ . More preferably, widths  $W_a$ ,  $W_b$  are less than about 5% greater than the respective shaft circumferences. In one preferred embodiment, an extra width of about 1 mm is added at each longitudinal or long side 46 of the decal wherein the first and second circumferences

are 44.25 mm and 37.82 mm, respectively. Thus, the widths are less than about 3% greater than the circumferences  $C_1$ ,  $C_2$ .

[0025] The length of the decal 36 is preferably less than about one-third the length of the shaft 16 and more preferably is less than one-fourth the shaft length. However, the decal length may be adjusted to anywhere between about 5% to 90% the length of the shaft, as desired according to the pattern 12 to be applied to the shaft 16. A lateral band 48, preferably a dark color such as black, is preferably provided at the second end B to aid in obscuring any small difference in matching the wrapped edges of the decal. The band 48 more clearly defines the end B of the decal and so also aids in the alignment and positioning of the decal onto the shaft. Alternatively, if a second shaft color is not desired to extend to the end of the decal, the band may be aligned to wherever the second color ends in the decal. At the first end A, a second lateral band may not be required since the second color 44 is typically intended to end beneath the grip 18. In alternative embodiments of the present invention, the pattern 12 provided via the decal 36 may be provided at a position anywhere along the length of the shaft 16, such as closer to the tip end 20 than the butt end 24.

[0026] FIG. 4 depicts an alternative decal 36' having features of the present invention. In this embodiment a background color 50 of the decal 36' matches the primary color 17 of the majority of the length of the shaft 16. Alternatively, the background color of the decal maybe omitted so that a substantially clear film is applied over the shaft and only decorative graphics 52 are visible. The overall effect does not provide an additional color to the shaft, however the decal having the wrap-around decorative graphics is still more easily applied. The decal application includes longitudinal alignment of the pattern 52 of the decal 36' so that applying the decal to the shaft 16 automatically aligns the pattern to the longitudinal axis of the shaft. Preferably, the pattern 12 including the club name or shaft performance characteristics is provided so that the large design is not visible to the golfer at address (see FIG. 1). In addition, in this embodiment a second lateral band 54 is provided that may be used to aid in obscuring any small difference in matching the edges 36 at the first end A. In this embodiment, both ends A, B of the pattern 12 are intended to be visible on each shaft.

[0027] In another embodiment, a decal having a length at least 5% of the longitudinal length of the shaft includes a second color different from the primary color of the shaft. The second color extends laterally 360 degrees about the shaft and longitudinally at least 6.5 mm between the ends A, B. The decal further includes between the ends A, B the second color extending at least 6.5 mm longitudinally and 181 degrees laterally about the shaft, in combination with at least two other colors within the remaining lateral 179 degrees.

[0028] A preferred method of the present invention for preparing a golf club shaft 16 with a heat transferred decal 12 is shown in FIG. 5 and comprises providing a tubular member 16 formed of a composite material and a decal 36. The tubular member has a butt end 24 and a tip end 20 and is treated on an outer surface to achieve a desired primary color 17.

[0029] A plurality of decals 36 is imprinted on a sheet of material 34 such as Mylar. Each decal has a generally trapezoidal shape. The dimensions of the decal 12 on the decal 36 are determined according to the final shapes of a variety of shafts that will use the decals. Information such as the desired location below the grip 18 for the end of the decal is also considered.

[0030] Each of the various shafts including the various flexes (e.g., T, S, R and M) and lengths, is measured along the upper portion 14 to obtain the outer diameters (ODs) at about 0.5 inch increments generally where the decal 36 is to be applied. The OD vs. distance from the butt end is plotted for each shaft and a best fit line is determined. A slope of this line is used for the dimensions of the pattern on the decal. In particular, a nominal or central longitudinal axis is defined for the decal 36 and the best-fit line slope determines the taper of the longitudinal edges 46 of the pattern 12 on the decal 36 from the first end A toward the second end B.

[0031] The first width  $W_a$  corresponds to an average OD at the first end A and the second width  $W_b$  corresponds to an average OD at the second end B. As discussed previously, the widths include an amount for overlapping the long edges 46 of the decal. Referring to FIG. 6, the lateral alignment band 48 is located at the second end B.

Decorative graphics and/or manufacturer and/or shaft flex information, for example, is located at a predetermined position on the decal. Preferably, a first design 56 is located at a +90° position, so that any additional design 58 to be located on the opposite side of the shaft is located at a -90° position (or +270° position). The relative +90°, -90° positions incorporate the taper or slope previously established for the shaft 16. The wrapping of the decal begins at the long edge 46 nearest the 90° position; alternatively, the opposite graphics may be wrapped first onto the shaft. Generally, designs are placed 180 degrees apart on the shaft by appropriate placement on the decal. Of course, in alternative embodiments there may be a single design located at the 90° position or several designs positioned throughout the width of the decal, as desired.

**[0032]** FIG. 7 shows another embodiment of a heat transfer decal according to the present invention, wherein a design portion 60 of the pattern 12 from the decal 36" is intended to extend beyond a main portion 62 that wraps 360 degrees about the shaft 16. The design portion may be at the first end A or at the second end B. Alternatively, two design portions may be provided at each end A, B, as desired.

**[0033]** The decal 36 is preferably wrapped about the tubular member nearer the butt end 24 than the tip end 20 such that the pattern's first end A is closer to the butt end and its second end B is closer to the tip end. The decal is heated under pressure such that the pattern 12 adheres to the tubular member 16 and laterally covers it in a continuous fashion. Factors to be controlled during the decal application include heat, pressure and application speed and they are predetermined for the specific pattern and shaft or shafts, as known to those skilled in the art.

**[0034]** Thus, a golf club shaft in accordance with the present invention incorporates a decal to having dimensions sized to substantially conform to the taper of the shaft, thereby providing a pattern about the shaft at least 360 degrees. A seam (not shown) formed at the junction of the longer edges 46 of the decal 36 is barely visible and provides enhanced aesthetics to the shaft. Preferably, the seam is positioned on the shaft so as not to be visible at address by the golfer. In addition, the decal and its application provide reduced labor and material costs per shaft thus prepared since a second (or third) or

background color may be applied concurrently with other designs or patterns by all of them being incorporated into the decal 36.

**[0035]** A golf club 10 having features of the present invention is formed by providing a grip 18 at the butt end 24 of the shaft 16 and a club head 22 at the tip end 20 of the shaft 16. The club head may comprise a wood-type head having a volume of at least 190 cc. Alternatively, the club head may comprise an iron-type head having a loft of at least 18 degrees. Hollow, iron-type or utility club heads may also be provided at the tip end of the shaft. Although putter-type heads typically do not require or utilize composite golf club shafts, such a shaft incorporating the present invention may also be used with golf club putters.

**[0036]** Although the invention has been disclosed in detail with reference only to the preferred embodiments, those skilled in the art will appreciate that additional shaft decals and methods for manufacturing golf club shafts can be included without departing from the scope of the invention. Accordingly, the invention is defined only by the claims set forth below.